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Case Report

Can the inferior mesenteric artery cause ureteropelvic junction obstruction?☆

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ABSTRACT

Ureteropelvic junction obstruction (UPJO) is a pathological condition characterized by obstruction of the junction between the renal pelvis and ureter, often resulting in dilatation of the renal collecting system. Aberrant accessory vessels or early branching of the inferior pole vessels are the most common causes of extrinsic UPJO. The inferior mesenteric artery has not been reported as a common cause of UPJO. Here, we report the case of a 7-year-old patient with UPJO and an anomalous inferior mesenteric artery. The patient was initially diagnosed with congenital uropathy during the evaluation for primary enuresis.

Introduction

UPJO is the most common form of upper urinary tract obstruction in children. The obstruction can be either intrinsic or extrinsic. Renal vascular anomalies, including the inferior pole vessels, are a common cause of ureteral obstruction, affecting 20%-40% of individuals, particularly children [1]. These vessels pass through the ureterovenous junction or anterior to the proximal ureter, causing mechanical obstruction. Whether the anomalous vessels cause the obstruction or are a covariate that occurs with intrinsic stenosis is unclear. Indeed, controversy has centered on whether these vessels are simply an anatomical variant with no pathological significance or whether they play a role in the pathogenesis of UPJO [2]. This report aims to provide insight into the clinical and surgical management of UPJO associated with mesenteric artery anomalies.

Abbreviation: APD, anteroposterior diameter; CT, Computed tomography; IMA, inferior mesenteric artery; UPJ, Ureteropelvic junction; UPJO, Ureteropelvic junction obstruction.

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Case presentation

A 7-year-old male patient has been followed for 3 years in our outpatient clinic for a congenital uropathy initially discovered during the investigation of primary enuresis. The enuresis improved with hygienic and dietary measures. The patient remained asymptomatic, with no lumbar pain or urinary tract infections.

Routine renal ultrasound monitoring revealed a progressive dilatation of the left renal collecting system. The most recent ultrasound showed a left UPJO with an anteroposterior diameter (APD) of 25 mm at the level of the ureteropelvic junction (UPJ). A Doppler ultrasound also identified an inferior polar artery. The renal parenchyma was of normal thickness.

A DMSA scintigraphy indicated reduced function of the left kidney, with a 48% relative function, attributed to the regular contoured pelvic dilatation. An abdominal CT scan (Figs. 1 and 2) was performed to further evaluate the vascular relationship with the UPJ. It revealed left pyelocalicial dilatation with an APD of 31 mm, thinning of the left renal parenchyma, and an inferior mesenteric artery crossing the left ureter, potentially contributing to the UPJO.

Several factors led to the decision to proceed with surgery: patient age, persistent renal pelvic dilatation, the nature of the UPJ obstruction as confirmed by MAG3 scintigraphy, thinning of the renal parenchyma, and the presence of the inferior mesenteric artery crossing the UPJ.

Per operative exploration (Fig. 3), showing an inferior mesenteric artery was intersecting the UPJ without causing

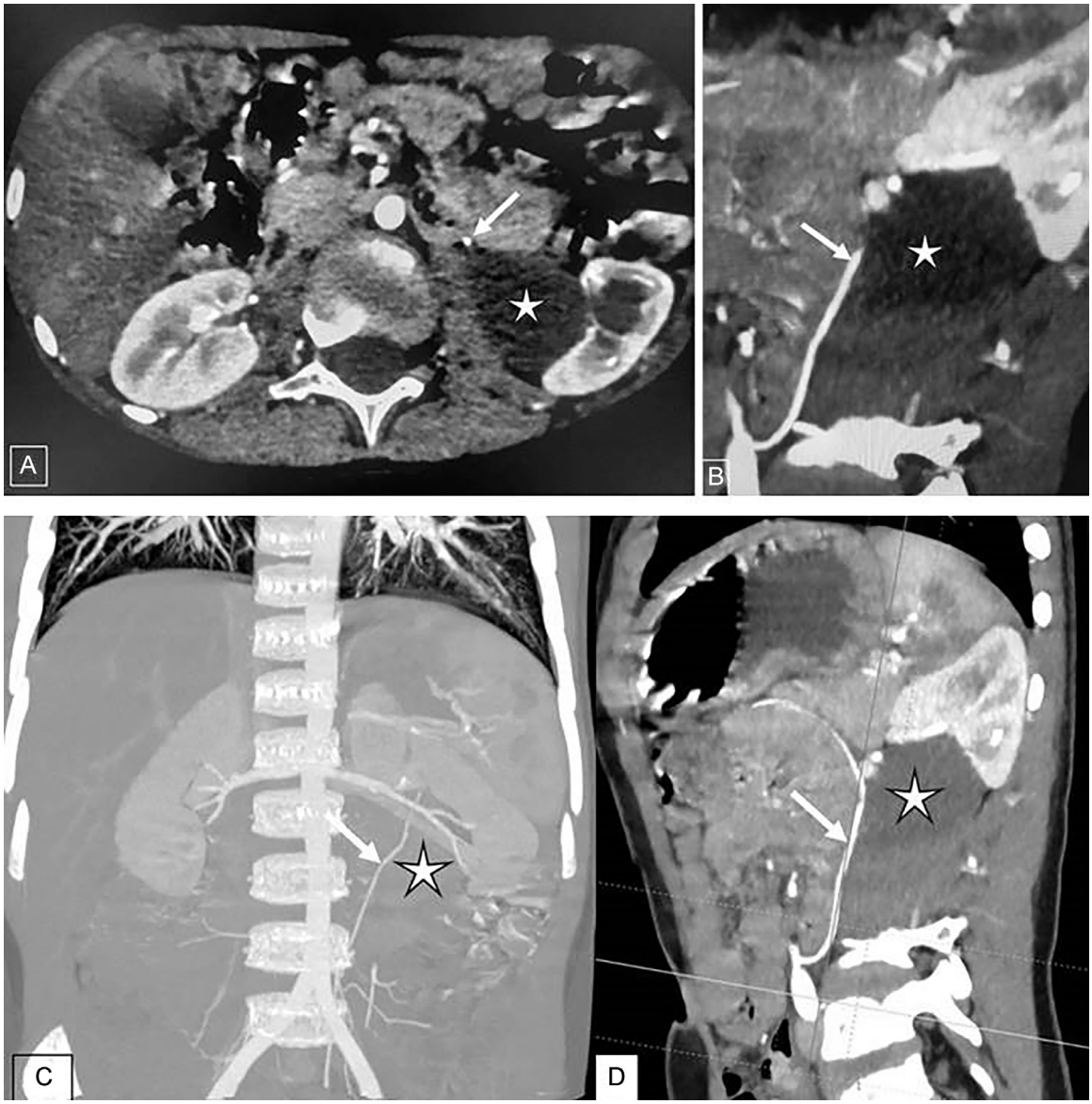

Fig. 1 – Contrast enhanced abdominal CT scan in arterial phase; (A) axial, (B) coronal oblique thin slices, (C) maximum intensity projection coronal reconstructions thick slices; and (D) coronal oblique (D) showing left renal pelvic dilation (white star) associated with crossing aberrant inferior mesenteric artery (white arrow) at the level of left ueretropelvic junction (UPJ).

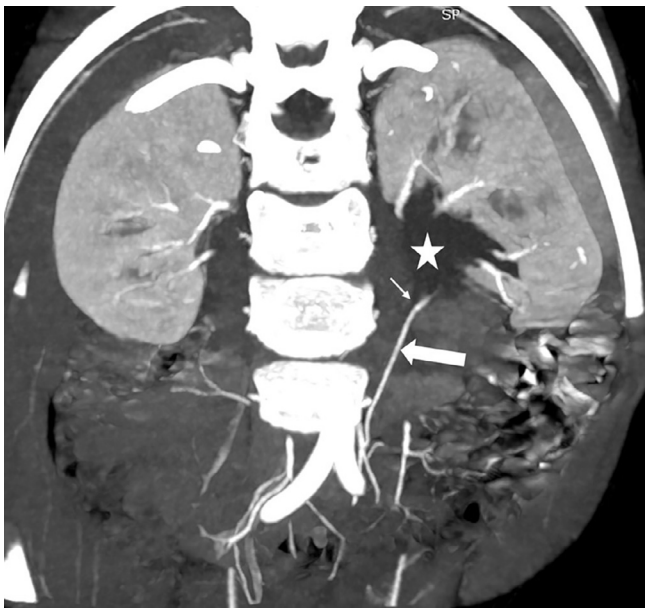

Fig. 2 – Contrast enhanced abdominal CT scan in arterial phase; coronal oblique reconstruction, showing the inferior mesenteric artery aberrant branch (thick white arrow) crossing the left uretero pelvic junction (thin white arrow) causing left renal pelvic dilatation (white star).

the obstruction. The surgical procedure was dissecting the UPJ while mobilizing the artery and performing a dismembered pyeloplasty using the Anderson-Hynes technique with PDS 6/0 interrupted sutures over a JJ stent.

Histopathological examination of the pyelo-ureteral junction revealed nonspecific fibrosis with smooth muscle hyperplasia.

The postoperative course was uneventful. The JJ stent was removed 1 month postoperatively, and follow-up imaging showed a reduction in pyelocalicial dilatation to an APD of 18 mm.

Discussion

UPJ obstruction is most commonly caused by intrinsic factors like congenital narrowing or abnormal development of the ureter [3,4]. However, extrinsic compression by blood vessels, known as “crossing vessels,” can contribute to or exacerbate UPJ obstruction. The most common crossing vessels implicated in UPJ obstruction are lower pole segmental renal vessels (arteries or veins) [3]. These vessels can arise from the main renal artery or vein, or branch as accessory vessels directly from the abdominal aorta, iliac artery, or inferior vena cava. Lower pole crossing vessels are found in about 20% of healthy patients, but their incidence increases to up to 45% in patients with UPJ obstruction [3]. These vessels can bow anteriorly or posteriorly over the ureter, potentially causing compression.

The inferior mesenteric artery is not typically mentioned as a primary cause of UPJ obstruction. However, it does play a role in the development and positioning of horseshoe kidneys, which are associated with a higher incidence of UPJ obstruction [4]. In horseshoe kidneys, the inferior mesenteric artery can impede the normal ascent of the fused kidneys during embryonic development [5]. This can result in the kidneys being positioned lower than normal, which may indirectly contribute to urinary tract abnormalities, including UPJ

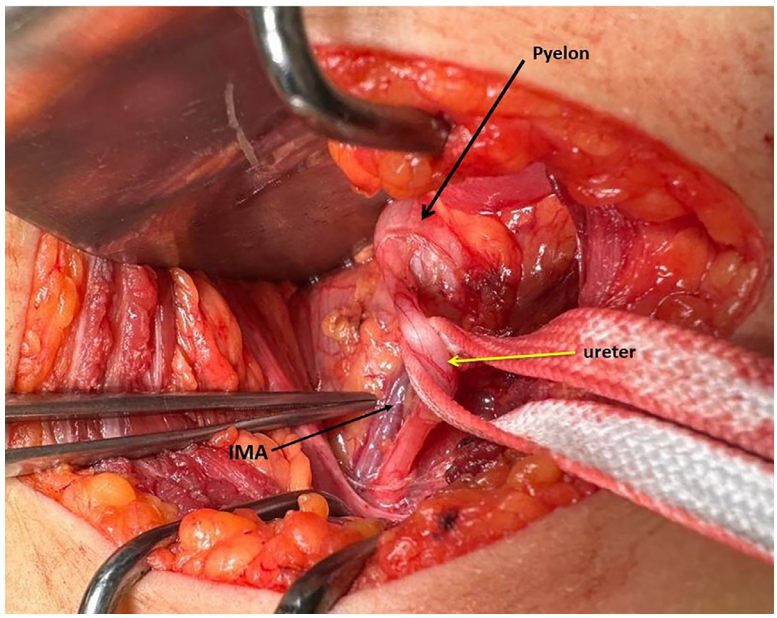

Fig. 3 – An intraoperative image showed the inferior mesenteric artery intersecting the ureteropelvic junction.

obstruction. UPJ obstruction in horseshoe kidneys is often attributed to other factors such as high ureteric insertion, irregular ureteral course, or aberrant blood vessels supplying the isthmus [5]. Our case presents a unique instance of ureteropelvic junction obstruction associated with an anomalous inferior mesenteric artery (IMA) in a nonhorseshoe kidney. This finding is exceptionally rare and holds significant clinical implications. The role of the IMA in contributing to UPJO in our case was explored through potential mechanisms, contrasting within typical renal vascular crossing scenarios. Despite initial imaging suggesting obstruction, surgical findings revealed the IMA was not directly causing the obstruction, prompting consideration of embryological factors influencing this unusual anatomical arrangement.

Various imaging modalities (Ultrasound, CT…) were reviewed for their efficacy in detecting and characterizing vascular anomalies in UPJO. Computed tomography (CT) angiography is much less invasive than angiography. The image can be reconstructed in 3 longitudinal dimensions and provides accurate information about blood vessels as small as 1 mm in diameter [1]. The importance of comprehensive imaging in surgical planning, particularly for cases with atypical vascular anatomy, was underscored.

Vascular anomalies in UPJO can cause significant problems during surgical interventions, such as endopyelotomy, due to the risk of intraoperative haemorrhage and the need for detailed preoperative evaluations to avoid complications [7].

The vessels compress the upper part of the ureter, resulting in varying degrees of hydronephrosis and possibly early obstruction of the ureteropelvic junction due to a higher degree of inflammation [6]. Histological studies have shown that the presence of crossing vessels does not significantly alter the histological features of UPJO, such as fibrosis, muscle hypertrophy, muscle dysfunction, and chronic inflammation, compared with cases without crossing vessels [8,9,10]. Therefore, some authors believe that vascular crossing is an associated finding in UPJO rather than the primary cause, emphasizing the complexity of this disease and the need for a comprehensive diagnostic and therapeutic approach [10].

Conclusion

This case highlights the rarity and clinical significance of UPJO associated with an anomalous IMA in a nonhorseshoe kidney. It underscores the importance of tailored approaches in managing UPJO, particularly in cases with unusual vascular anatomy, potentially advancing our understanding and treatment strategies for this condition.

We used generative AI (Chat GPT) to improve language.

Patient consent

We want to assure you that we have obtained the necessary consent from the parents of the patient for the publication of this case report and accompanying images.

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